July 13, 1943. S. C. PYK 2,324,108

AUTO VALVE ARRESTER

Filed March 30, 1940 2 Sheets-Sheet 1

Fig. 1

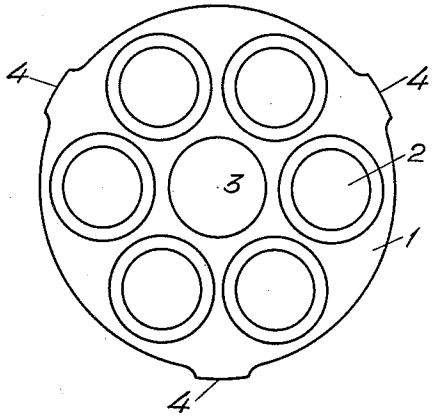


Fig. 2

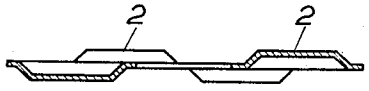
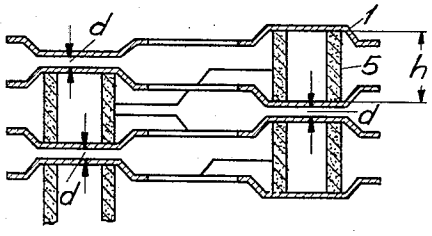


Fig. 3



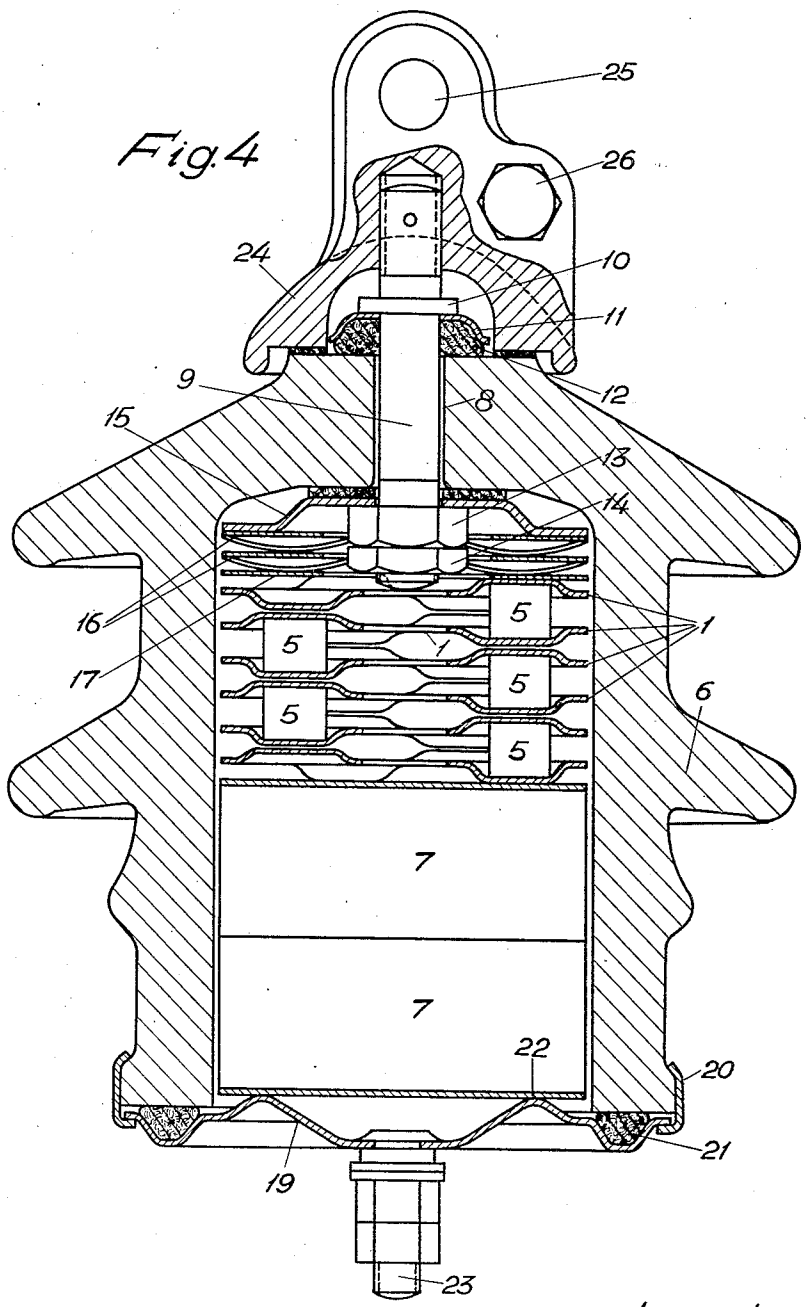
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Fig. 4



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2,324,108

AUTOVALVE ARRESTER

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7 Claims. (Cl. 175—30)

Autovalve arresters for electrical networks generally consist of an arc gap pile comprising a series of arc gaps connected in series with a resistance. This resistance now generally is made of a material changing its resistance when the voltage changes, in the following called voltage sensitive resistance. In the hitherto used arc gap piles for such arresters the different arc gaps have been formed by metal plates piled up over each other with thin perforated distance sheets of a suitable insulating material, generally mica. This type of arc gap piles is, however, combined with several disadvantages. So it is difficult to adjust the length of the arc gaps to the right value, because the length of the arc gap is dependent upon the thickness of the insulating sheets interposed between the plates. The hitherto used arc gaps have also due to the small distance between the plates over the whole surface a rather considerable capacity, which is a disadvantage with respect to the function of the arrester.

The present invention has for its object an arc gap pile of above mentioned kind, but in comparison with hitherto known types a very reduced capacity between the electrode plates is reached by the invention. The creepage distance between successive plates will also be much greater for the same arcing distance.

According to the invention the arc gaps also are formed in known manner between a series of electrode plates piled up over each other, but in contradiction to hitherto known types the electrode plates are provided with a plurality of impressions extending alternatingly in one or the other direction. When piled up, the plates are displaced in relation to each other, so that the convex sides of the impressions in one plate are turned against the convex side of the impressions in a succeeding plate, and thus the concave sides of the impressions in one plate will be opposite to the impressions in a succeeding plate. Between the plates distance pieces are inserted, which pieces rest against the bottom of the impressions. These distance pieces are suitably of a cylindrical form and their height is chosen so great that the distance between the convex sides of the impression of two successive plates will be the distance corresponding to the desired arcing distance. The arcing distance is thus adjusted by the height of the distance pieces.

The whole pile of plates with its insulating pieces is suitably assembled together with blocks of a voltage sensitive resistance material arranged in a cylindrical insulator. The plates are then in the periphery provided with three or more projections, which reach to the inner surface of the insulating cylinder. The projections in two successive plates will due to the above mentioned displacement of the plates be displaced with respect to each other, so that the creepage distance between the edges of the plates or between the projections will be comparatively great. Instead of inserting the pile in an insulating cylinder, the plates can be held together by means of an insulating bolt or rod traversing a central hole in the plates, which bolt also may traverse holes in the blocks of the resistance material. The diameter of this bolt is preferably smaller than the diameter of the central hole, so that the creepage path along the bolt will be as long as possible.

On the accompanying drawings, Fig. 1 shows an electrode plate for the arc gap according to the invention, and Fig. 2 shows the same electrode plate in section. Fig. 3 shows the arrangement of the electrode plates with the distance pieces, which in the figure are formed as hollow cylinders, and Fig. 4 shows a complete arrester according to the invention.

As shown by Fig. 1, the electrode plate 1 is provided with six electrodes or depressions 2 suitably provided with a central hole 3 and projections 4 extending from the periphery. As shown by Fig. 2, the impressions 2 alternatingly are turned upwards and downwards. From Fig. 3 it is clear how the plates are arranged over each other, and from this figure also the arrangement and form of the distance pieces is clear. These pieces are in the figure designated by 5. It is clear that by a variation of the height H of the distance pieces 5 the length d of the arc gaps between the convex sides of the impressions 2 can be adjusted.

In Fig. 4, which shows a complete arrester, the cylindrical space in the insulator 6 is in its upper part occupied by the electrode plates 1 with the distance pieces 5, and the lower part of the space is occupied by the block 7 of a voltage sensitive material. In the upper part of the insulator 6 is a hole 8 traversed by the terminal bolt 9. This is outside the insulator provided with a collar 10, against which a washer 11 rests, and between the insulator and the washer a packing 12 is inserted, which can be compressed by the nut 13 in the space of the insulator 6, said nut being locked by the locking nut 14. The nut 13 also presses a metal washer 15, the edge of which rests against two spring washers 16, and these in their turn press against a washer 17, which rests on

the uppermost of the electrode plates 1 of the arc gap pile.

Below the arc gap pile are two blocks 7 of a voltage sensitive material, and the whole is held in the insulator 6 by means of the metal bottom 19, which is fastened to the insulator 6 by the bent-over edge 20. The tightening between the bottom and the insulator is achieved by means of a packing 21, and the bottom 19 is provided with an upwardly projecting rim 22, which presses against the lower side of the lowermost block 7. In the bottom 19 further a terminal bolt 23 is fastened. For mounting the arrester, the bolt 9 is provided with a metal cap 24, which is fastened to the bolt 9 by means of a thread, and the cap is provided with a hole 25 and a terminal screw 26.

As shown by the figures, the height of the pile will be rather small in spite of the thickness of the insulating material between the electrode plates. This is made possible by the impressions in the electrodes, because by these impressions the distance pieces between two plates are displaced in vertical direction with respect to the distance pieces between the succeeding electrode plates. By the fact that the larger part of the surface of the electrode plates with exception of the surface forming the arcing gap is in a rather great distance from the corresponding part of the surface of a succeeding plate, the capacity between the plates will be very small. A further advantage with the invention is that the distance pieces have a simple form, so that they easily can be adjusted for instance by grinding, and by this simple form they also easily can be made of a high-ohmic material, for instance a voltage sensitive material. This material is a ceramical product, which cannot be given a complicated form, and it can also not be given the form of thin sheets. There is, however, no difficulty in giving it the form of short cylinders or pipes. By using, as distance pieces between the electrode plates, material of high ohmic resistance and also sensitive to the voltage, an even distribution of the voltage of the different spark gaps is obtained. This is of great importance since, when only insulating material is employed, the voltage over one gap can be considerably higher than another, due to different capacity to earth.

I claim as my invention:

1. An arc gap edvice, comprising a pile of metal plates, each formed with a plurality of concavo-convex portions arranged to face alternately in opposite directions to present series of opposed convex faces and series of opposed concave faces staggered along the axial length of the pile, and distance pieces of material of high ohmic resistance and also sensitive to the voltage between opposed concave faces, said pieces having such dimensions in the direction of the axis of the pile that suitable arc gaps are formed between the opposed convex faces in opposed plates.

2. An arc gap pile for connection with a voltage sensitive resistance in an autoarrester for the protection of electrical networks or machines, comprising a plurality of metal plates having generally flat faces, said plates being spaced from each other and each plate having a plurality of oppositely directed spaced impressions each forming a depression in one face and a protuberance on the opposite face of the plate, the plates being assembled with their depressions opposed to the depressions and with the protuberances opposed to the protuberances of adjacent plates, and distance pieces of high ohmic resistance material extending into and between opposed depressions between each pair of adjacent plates and having such a dimension in the direction of the axis of the pile that suitable arc gaps are formed between the protuberances opposed to each other.

3. An arc gap device comprising a pile of at least three spaced metal plates, each having a plurality of oppositely directed, concavo-convex indentations therein, the concave and convex indentations in one side of each plate being respectively opposite the concave and convex indentations in the adjacent side of the next plate, and distance pieces of high ohmic resistance interposed between the opposed concave indentations of each pair of adjacent plates, whereby to provide arc gaps between each of the opposed convex portions.

4. An arc gap device comprising a pile of substantially flat metal plates having a plurality of oppositely directed, concavo-convex, frusto-conical similar impressions therein, the concave and convex impressions on one side of each plate being respectively opposite the concave and convex impressions in the adjacent side of the next plate, and distance pieces of high ohmic resistance engaged between the opposed concave impressions between each pair of adjacent plates, whereby to provide arc gaps between the flat faces of the opposed frusto-conical convex portions.

5. An arc gap device comprising a pile of substantially flat metal plates, each having a central portion and a plurality of concavo-convex impressions symmetrically disposed in opposed pairs with respect to the central portions, the impressions in each opposed pair being oppositely directed, said plates being arranged in the pile with the concave and convex impressions in one side of one plate respectively opposite the concave and convex impressions in the adjacent side of the next plate, and distance pieces of high ohmic resistance engaged between at least two pairs of the opposed concave impressions of each pair of adjacent plates, whereby to provide arc gaps between each of the opposed convex impressions.

6. The combination claimed in claim 5, the impressions having flat ends, whereby the opposed faces of the opposed convex impressions are flat, the distance pieces being cylindrical at their ends, whereby to engage snugly in the opposed concave impressions.

7. The combination claimed in claim 5, the impressions being frusto-conical.

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